

In the hinge structure described above, the hinge structure 20 is bent by the pressure of the operation button 10 and the operation button 10 swings relative to the support frame 30. Such operation is repeatedly performed. By repeatedly performing such operation, the hinge structure 20 and predetermined positions therearound are susceptible to breakage.

[0010]

A stress analysis was carried out to the hinge structure member shown in Fig. 1 while the operation button 10 was being pressed. It is known from the result of the analysis that high stress concentration is observed around the root of the hinge structure 20 on the side of the support frame 30 (the hatched area), and the stress concentration shows particularly high value at two corners of the hinge structure 20 (the cross-hatched areas).

The shorter the hinge structure 20 in the axial direction (the Z-axis direction) is, the higher the stress concentration is.

To a car audio device, since its operation panel has a given size, and additionally, since its display that employs an LCD becomes large in recent years, there arise problems deprived from a limited space for arranging the operation button.

[0011]

An object of the present invention is to provide a hinge structure and a hinge structure member capable of relieving stress concentration around connected portions of the hinge structure.

[MEANS FOR SOLVING THE PROBLEMS]

[0012]

A hinge structure according to an aspect of the present invention includes: a hinge portion ~~for swingably connecting a pair of connected portions to each other~~ that connects a fixed member and a movable member to each other and allows the movable member to swing relative to the fixed member; and a pair of connection portions adapted to respectively connect the hinge portion to the fixed member and the movable member, wherein ~~at least one of the connection portions is extended in an axial direction along a specified surface of one of the connected portions and continuously~~

~~connected to the specified surface~~ the fixed member has a recessed portion on a surface thereof, and the connection portion on the side of the fixed member is extendedly provided adjacent to the recessed portion.

A hinge structure member according to another aspect of the present invention includes: ~~a pair of connected portions; a hinge portion for swingably connecting the pair of connected portions to each other; and a pair of connection portions adapted to connect the hinge portion to the connected portions, wherein at least one of the connection portions is extended in an axial direction along a specified surface of one of the connected portions and continuously connected to the specified surface~~ the aforesaid hinge structure of the present invention.

[BRIEF DESCRIPTION OF DRAWINGS]

[0013]

[FIG 1] Fig. 1 is a perspective view showing a prior art;

[FIG 2] Fig. 2 is a perspective view showing a first embodiment of the present invention;

[FIG 3] Fig. 3 is a front elevational view showing the first embodiment;

[FIG 4] Fig. 4 is a side elevational view showing the first embodiment;

[FIG 5] Fig. 5 is a plan view showing the first embodiment;

[FIG 6] Fig. 6 is a perspective view showing a second embodiment of the present invention;

[FIG 7] Fig. 7 is a perspective view showing a third embodiment of the present invention;

[FIG 8] Fig. 8 is a perspective view showing a fourth embodiment of the present invention;

[FIG 9] Fig. 9 is a side elevational view showing a fifth embodiment of the present invention;

[FIG 10] Fig. 10 is a side elevational view showing a sixth embodiment of the present invention;

[DOCUMENT NAME] CLAIMS

[1] (Amended) A hinge structure comprising:

a hinge portion ~~for swingably connecting a pair of connected portions to each other~~that connects a fixed member and a movable member to each other and allows the
5 movable member to swing relative to the fixed member; and

a pair of connection portions adapted to respectively connect the hinge portion to
~~the connected portions~~the fixed member and the movable member,

wherein ~~at least one of the connection portions is extended in an axial direction~~
~~along a specified surface of one of the connected portions and continuously connected to~~
10 ~~the specified surface~~the fixed member has a recessed portion on a surface thereof, and the
connection portion on the side of the fixed member is extendedly provided adjacent to the
recessed portion.

[2] The hinge structure according to claim 1, wherein

the connection portion and the hinge portion are integrally formed by molding
15 elastically deformable synthetic resin.

[3] (Amended) The hinge structure according to claim 2, wherein

the connection portion, the hinge portion ~~and, the connected portions~~the fixed
member and the movable member are integrally formed.

[4] ~~(Deleted)~~The hinge structure according to claim 3, wherein—

20 ~~the connection portion is arranged in a recessed portion provided on the specified~~
~~surface of the connected portion.~~

[5] ~~(Deleted)~~The hinge structure according to any one of claims 1 to 4, wherein—

~~the hinge portion is arranged in the axial direction.~~

[6] (Amended) The hinge structure according to any one of claims 1 to 5~~3~~, wherein

25 the hinge portion and at least one of the connection portions have their side
surfaces smoothly continued to each other.

[7] (Amended) A hinge structure member comprising the hinge structure according
to any one of claims 1 to 3 and 6.:-

~~— a pair of connected portions;—~~

~~_____ a hinge portion for swingably connecting the pair of connected portions to each other; and~~

~~_____ a pair of connection portions adapted to connect the hinge portion to the connected portions;~~

5 ~~_____ wherein at least one of the connection portions is extended in an axial direction along a specified surface of one of the connected portions and continuously connected to the specified surface.~~

[8] ~~(Deleted) The hinge structure member according to claim 7, wherein~~

10 ~~_____ one of the connected portions is a fixed member, and the other of the connected portions is a movable member.~~

[9] ~~(Amended) The hinge structure member according to claim 8, wherein~~

~~the fixed member is a support frame, and the movable member is an operation button.~~